GAR-7
FREQUENCY READOUT

GILFER Associates, Inc.
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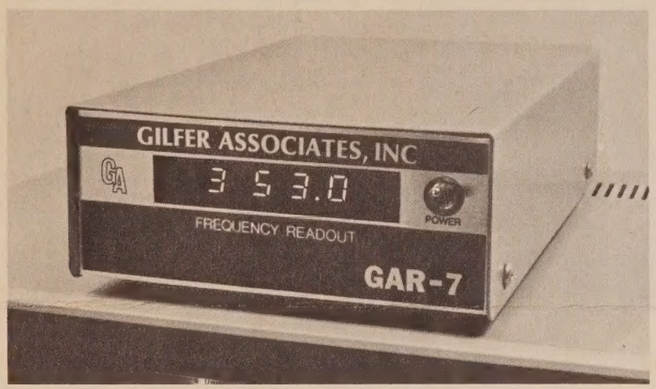
United States of America



UNPACKING: Carefully remove the Model GAR-7 from its shipping container and set aside the prefabricated coax connecting cable with the attached phono jack. Unwrap and free the a-c cord. Plug the GAR-7 into a convenient 117-volt a-c outlet, turn ON and see if the display reads 455.0.

If the display is correct and there is no apparent shipping damage proceed with installation.

Fill in the enclosed Warranty Card and mail it back to GILFER within 7-10 days. Your GAR-7 has a standard Limited Warranty of 90 days as explained in the enclosed notice.

If the display does not read, or if your GAR-7 is damaged, contact GILFER immediately. DO NOT ship equipment to GILFER without first obtaining an Authorization Form from our Service Department. Unauthorized returns only result in delays and missorted incoming equipment.

THEORY and SPECIFICATIONS: The Model GAR-7 Frequency Readout is designed to be coupled to radio receivers employing the Wadley Loop frequency tuning technique and a third i.f. stage of 455.0 kHz.

Detailed theory on the Wadley Loop usually appears in the Instruction Manual of receivers with this circuit. The major assets of the Wadley Loop are drift-free pre-setting of each megaHertz band (7, 8, 9, 10, etc.) and ease of calibration of the additive kiloHertz interpolation oscillator (hereafter "VFO"). With good mechanical and electronic design the usually modestly-priced Wadley Loop receiver can be calibrated--analog fashion) to ±5 kHz.

The GAR-7 is designed around a special down counting circuit offset by 455.0 kHz. Due to the synthesis approach of the Wadley Loop, the lowest analog tuned frequency by the "KHZ" control (reading 000) VFO is 3.455 MHz and the highest tuned frequency (reading 1000) is at 2.455 MHz. Thus, in addition to a 455.0 kHz offset, the readout must be inverted to display the true tuned "KHZ" frequency.

Timing signals in the GAR-7 are derived from a 3.579600 MHz crystal that is divided by 357,960 through integrated circuits. This develops a gate interval of 100 milliseconds and during this counting interval the VFO from the receiver is sampled, measured, memorized and then displayed. The rapidity of this sample/hold and display function is faster than the retentivity of vision and also eliminates any possibility of the GAR-7 flickering or bobbling (a condition found in other designs). The frequency displayed by the GAR-7 is the actual kiloHertz frequency of the received signal (to be added to the pre-set "MHZ").

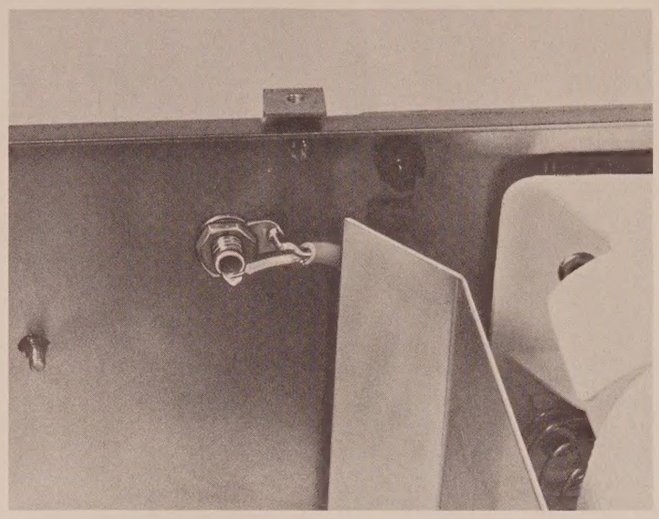
At normal operating temperatures for receiving equipment, the GAR-7 has a stability of ±5 parts per million and a resetability of the time base that is better than ±2 ppm. A user adjustment accessible through a small hole in the bottom of the cabinet permits correction of the input/offset by ±1.5 kHz. The display format comprises 4 bright red color 7-segment 0.3" LED readouts. A power input of 108-130 volts 50-60 Hz is required.

The input impedance of the GAR-7 is greater than 1 megohm in parallel with approximately 35 pF. Due to the use of CMOS logic, copious filtering and "tuned" grounding there are virtually no discernible spurious signals attributable to the GAR-7 Frequency Readout.

ATTACHMENT to a YAESU FRG-7: Disconnect the antenna(s) and a-c power cord. Remove the 9 Phillips head screws around the gray cabinet and slip the front panel and receiver chassis out of the cabinet (it may be necessary to also remove the two rear feet).

Carefully drill a 3/8" diameter hole in the rear chassis wall in the approximate position shown in the photograph. Be sure that the hole doesn't interfere with the battery retaining shield (in some models).

Clean away any burrs left from the drilling



Counter jack mounting on rear panel of FRG-7.

that might have dropped onto the chassis. Remove the ½" nut from the phono jack and push the jack through the hole from the inside of the chassis wall outwards. Finger tighten the ½" nut as much as possible and then carefully grasp the hex portion of the phono jack inside the chassis wall, tighten the nut from outside the wall. Gas pliers, adjustable end wrenches or a nut driver may be used.

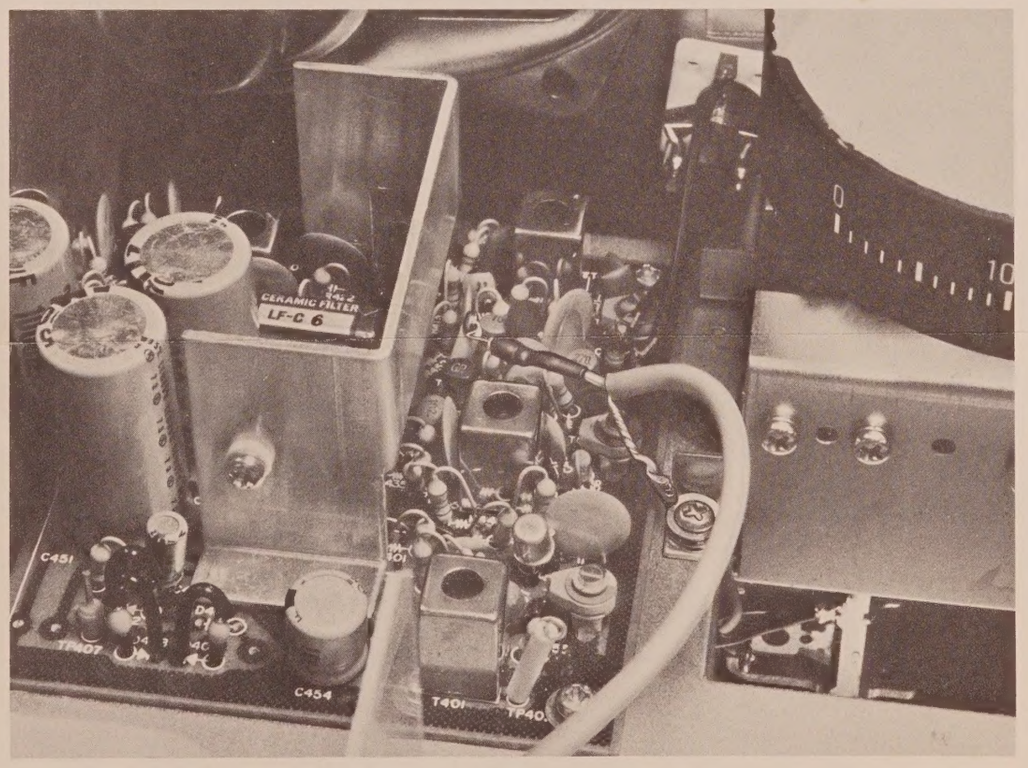
Drape the cable over toward the "KHZ" dial drum. The frequency that'll be read by the GAR-7 is obtained from the circuit of transistor Q404 through test point TP404. Position the receiver as in the photograph and familiarize yourself with the location of the three miniature i-f transformers, aluminum heat sink and TP404--which may be either a metal stake in recent models, or a white covered insulated wire with a small loop at the free end. In both instances the other end of the stake/wire is soldered in place under the chassis on the printed circuit board.

Using a Phillips screwdriver, carefully back out the screw that attaches the bracket holding the "KHZ" tuning capacitor to the top of the chassis. Push the spade lug of the coax braid under the screw and re-tighten.

Depending on the type of test point TP404, wire wrap the thin lead from the series capacitor around the stake, or loop it through the 2-turn coil spring (white insulated). A good electrical connection is required and soldering is not absolutely necessary, but is desirable. If you solder use as little heat as possible and be careful not to contact the transistor Q404 with the soldering iron.

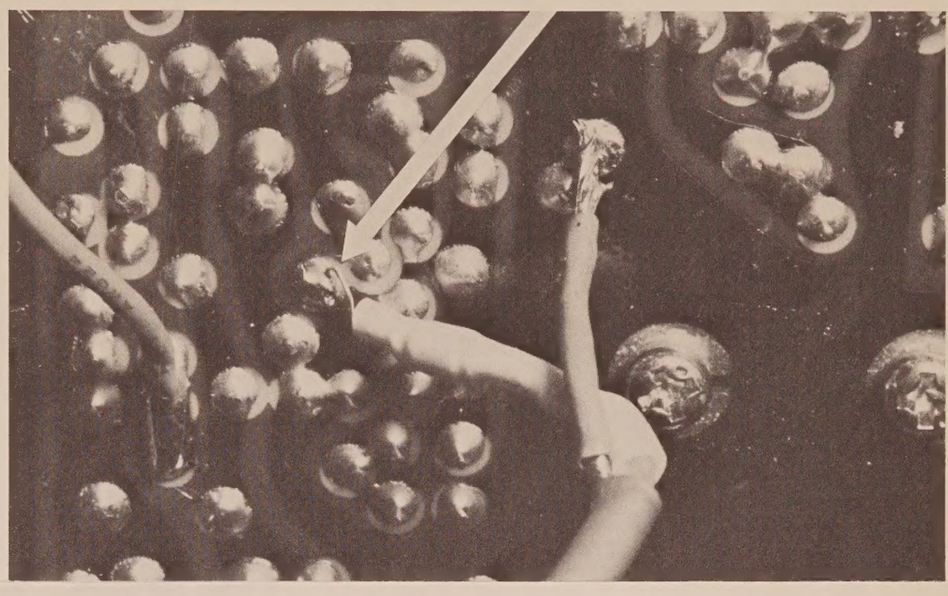
This completes the electrical connecting. It is now appropriate to test the GAR-7 prior to re-assembling the FRG-7 cabinet. Plug both the receiver and the GAR-7 into a-c outlets and the cable from the GAR-7 into the new counter output jack. The counter should read the exact frequency of the "KHZ" VFO, regardless of the analog dial setting (but usually with ±5 kHz). Spin the "KHZ" knob down to 000 and up to 1000 to see if the GAR-7 tracks.

If all is in order, disconnect from the a-c lines and re-assemble the receiver. In most



The prefabricated cable supplied with the GAR-7 comprises a phono jack, coax cable and low value series capacitor. The braid of the cable is attached to ground under the Phillips head screw shown in this photo. A thin wire lead from the series capacitor is attached to a test point on the chassis that is plainly labelled TP404.

The GAR-7 is connected to an SSR-1 receiver on the foil printed circuit pattern side of the board. Access to this portion of the receiver calls for removal of the panel under the receiver (held in by 4 Phillips head screws). The connection is made under the "KHZ" tuning control. Position the receiver so that the two Phillips head screws in this photo are visible. Pick out the PC foil with 6 soldered connections as shown here by the arrow.



instances the GAR-7 will be positioned atop the receiver over the analog dial drum and S-meter. The last thing to do is to back out the Phillips head screw on the rear chassis wall and attach the ground lead (green) from the GAR-7 chassis to the FRG-7 chassis.

Attachment to R.L. Drake SSR-1: To simplify connections between the GAR-7 Frequency Readout and the Drake SSR-1 we recommend eliminating the "MUTE" function--which is only a short-circuited phono plug/jack. The "MUTE" function would only be used by a radio amateur in conjunction with a transmitter.

If the "MUTE" phono jack is to be used, the jack soldered to the prefabricated cable can be unsoldered and discarded. Remove the shorted phono plug from the "MUTE" and discard. Carefully unsolder the lead going to the center pin of the "MUTE" phono jack and re-solder to the tab where the shield braid is soldered. Test the receiver to be sure that the necessary short-circuit to disable the "MUTE" has been made.

From a circuit viewpoint, the thin wire lead from the series capacitor (at the end of the cable opposite the phono jack) is going to be soldered to the underside of the SSR-1 chassis at the junction of C86/C91/C92/R57 and the collector of Q13 (the wiring diagram of the SSR-1 is only marginally correct--besides being unreadable). There is no easy method of quickly identifying this particular junction and you must pay particular attention to the photograph (nothing will happen if the cable is connected to the wrong foil pattern--the GAR-7 simply won't read).

Soldering must be done with considerable care to not overheat adjacent components or form a solder bridge. The braid ground connection of the prefabricated cable should be soldered to the foil side of the printed circuit board as shown (clip off the spade lug).

Unlike the FRG-7 attachment, coupling the GAR-7 to an SSR-1 will pull the "KHZ" analog dial readings off frequency by as much as 10 kHz. This pulling has minimal effect on the receiver and the analog dial may be corrected by careful readjustment of transformer L21--matching the GAR-7 readings to the analog dial.

The ground lead from the GAR-7 should be electrically connected to the SSR-1 by releasing one of the thumb screws for the battery compartment and placing the lug under the screw and retightening.

Attachment to Barlow XCR-30: Any coupling to of the GAR-7 to a Barlow XCR-30 should only be attempted by someone familiar with the disassembling of the receiver and removal of the front panel.

A 3/8" hole for the phono jack may be drilled in either the back panel (keep clear of the battery holder) or the side panel (opposite the earphone and power input jacks).

When the jack has been installed, clip off the spade lug on the shield braid and solder the braid to the visible ground jumper strap to the immediate right hand side of transformer T2 (looking in from the back). The thin lead from the series capacitor is to be connected to the junction of C53/R38 and the emitter of TR9. Except in the very early XCR-30 receivers, there is a spare hole in the printed circuit board where this lead may be passed through and soldered in place from the underside of the board (panel side).

As with the SSR-1, attachment of the GAR-7 will pull the "KHZ" VFO off frequency, but this can be adjusted for by variation of the settings of C46 and T1.

Possible Problems: Of the 3 Wadley Loop circuit receivers discussed in this GAR-7 Instruction Sheet, the ceramic filter (either original equipment or GILFER modified) in the Yaesu FRG-7 is of better quality and more closely peaked to exactly 455.0 kHz than the filters in either the Drake SSR-1 or Barlow XCR-30. Our tests indicate that the "usual" Yaesu FRG-7 is within ±100 Hz of the true transmitted frequency. Use a good strong clean signal from WWV to check the GAR-7 calibration and if necessary (very rarely) adjust the "Frequency Calibration" control visible through the small hole in the bottom of the GAR-7.

Unfortunately, some SSR-1 and XCR-30 receivers will have filters peaked beyond the adjustment range of the GAR-7. When this occurs, contact GILFER Associates, Service Department for additional calibration instructions.

If your GAR-7 bobbles or shifts erratically among the last 3 digits, it is most likely due to either mistuning of the "PRESELECTOR" control (or wrong "BAND" setting), or to severe overloading of the VFO and agc line by a local CB'er or amateur radio operator. Another common condition that can make the GAR-7 bobble will be excessive signal input from International Broadcasters on the 31, 40 or 49 meter bands. In the latter instance putting the "ATTENUATOR" switch into either the 10 or 20 dB position will immediate cure the bobbling.

Maintenance: Unless abused, your GAR-7 should require no maintenance and should have a life expectancy equal to or greater than the receiver to which it is attached.

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